1. An energy-trap thickness extensional vibration mode piezoelectric resonator, comprising:

a piezoelectric body including a plurality of piezoelectric layers and uniformly polarized in a thickness direction thereof; and

N number of internal electrodes, where N equals 3, 4 or 5, arranged in the piezoelectric body on top of each other with the piezoelectric layers disposed therebetween; wherein

the piezoelectric body vibrates in an (N-1)th higher-order mode of a thickness extensional vibration mode generated by applying electric fields of opposite polarity alternately in the direction of thickness to piezoelectric layers between internal electrodes, and when the thickness of a piezoelectric layer between adjacent internal electrodes in the direction of thickness is denoted by D and the thicknesses of a first and second piezoelectric layer outside the outermost internal electrodes in the direction of thickness are denoted by $D_1$ and $D_2$, the following relationships are satisfied: $0.50 \leq (D_1 + D_2)/2D \leq 1.00$ at N = 3, $0.50 \leq (D_1 + D_2)/2D \leq 0.90$ at N = 4, and $0.50 \leq (D_1 + D_2)/2D \leq 0.80$ at N = 5.

3. An energy-trap thickness extensional vibration mode piezoelectric resonator, comprising:

a piezoelectric body including a plurality of piezoelectric layers and uniformly polarized in a thickness direction thereof; and

N number of internal electrodes, where N equals 3, 4 or 5, arranged in the piezoelectric body on top of each other with the piezoelectric layers disposed therebetween; wherein

the piezoelectric body vibrates in an (N-1)th higher-order mode of a thickness extensional vibration mode generated by applying electric fields of opposite polarity alternately in the direction of thickness to piezoelectric layers between internal electrodes, and when the thickness of a piezoelectric layer between adjacent internal electrodes in the direction of thickness is denoted by D and the thicknesses of a first

and second piezoelectric layer outside the outermost internal electrodes in the direction of thickness are denoted by $D_1$ and $D_2$, the following relationships are satisfied: $0.10 \leq (D_1 + D_2)/2D \leq 0.80$ at N = 3, $0.10 \leq (D_1 + D_2)/2D \leq 0.50$ at N = 4, and $0.10 \leq (D_1 + D_2)/2D \leq 0.45$ at N = 5.

5. An energy-trap thickness extensional vibration mode piezoelectric resonator, the piezoelectric resonator comprising:

a piezoelectric body including a plurality of piezoelectric layers; and

N number of internal electrodes, wherein N equals 3, 4 or 5, disposed in the piezoelectric body and stacked on each other with the piezoelectric layers disposed therebetween; wherein

the piezoelectric body vibrates in an (N-1)th higher-order mode of a thickness extensional vibration mode and piezoelectric layers located between the internal electrodes are polarized in opposite direction alternately in the direction of thickness, and when the thickness of a piezoelectric layer between adjacent internal electrodes in the direction of thickness is denoted by D and the thicknesses of a first and second piezoelectric layer outside the outermost internal electrodes in the direction of thickness are denoted by $D_1$ and $D_2$, the following relationships are satisfied: $0.60 \leq (D_1 + D_2)/2D \leq 1.10$ at N = 3, $0.65 \leq (D_1 + D_2)/2D \leq 0.90$ at N = 4, and $0.60 \leq (D_1 + D_2)/2D \leq 0.80$ at N = 5.

7. An energy-trap thickness extensional vibration mode piezoelectric resonator, comprising:

a piezoelectric body including a plurality of piezoelectric layers; and

N number of internal electrodes, wherein N equals 3, 4 or 5, disposed in the piezoelectric body and stacked on each other with the piezoelectric layers disposed therebetween; wherein

the piezoelectric body vibrates in an (N-1)th higher-order mode of a thickness extensional vibration mode and piezoelectric layers located between the internal

electrodes are polarized in opposite direction alternately in the direction of thickness, and when the thickness of a piezoelectric layer between adjacent internal electrodes in the direction of thickness is denoted by D and the thicknesses of a first and second piezoelectric layer outside the outermost internal electrodes in the direction of thickness are denoted by $D_1$ and $D_2$, the following relationships are satisfied: $0.10 \leq (D_1 + D_2)/2D \leq 1.10$ at N = 3, $0.10 \leq (D_1 + D_2)/2D \leq 0.90$ at N = 4, and $0.10 \leq (D_1 + D_2)/2D \leq 0.80$ at N = 5.

15. A piezoelectric resonator component comprising:

a thickness extensional vibration mode piezoelectric resonator according to claim 5;

a case substrate bonded to the piezoelectric resonator so as to define a space for allowing the piezoelectric resonator to vibrate; and

a conductive cap bonded to the case substrate so as to enclose the piezoelectric resonator.